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ABSTRACT

The redesigned Student Descriptive Questionnaire (SDQ) provides information about the number of years of study and types of courses in Scholastic Aptitude Test (SAT) examinees' academic backgrounds. This study used data from the 1987 National Sample Tape, which contains SDQ responses and score information from 100,000 seniors in the class of 1987. The analysis examined the relationships between both the Admissions Testing Program SAT and Achievement Test scores and the type and level of coursework in six academic areas. Data were adjusted to account for differences related to student academic achievement. Results indicate that coursework in disciplines of mathematics, natural science, and foreign languages has the strongest adjusted relationships with SAT mathematics scores. SAT verbal scores appear to be most strongly related to the number of years of foreign language coursework. Course relationships are strongest for students with high grade point averages and stronger for males than females. Analyses of Achievement Test data support these findings. Findings must be accepted with caution due to the exploratory nature of the research and the effects of self-selection of students in the various courses. Forty-six data tables and one figure are included. (TJH)

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College Board Report

No. 89-6

An Examination of the Relationships of Academic Coursework with Admissions Test Performance

Rick Morgan

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College Board Report No. 89-6
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ABSTRACT

The redesigned Student Descriptive Questionnaire (SDQ) provides a great deal of background information about examinees sitting for the Scholastic Aptitude Test (SAT). One set of questions focuses on the number of years and types of courses in the students' academic background. This information makes it possible to explore the relationships between coursework and performance on the SAT. This study used data from the 1987 National Sample Tape, which contains SDQ responses and score information from 00,000 seniors in the class of 1987. The analyses examined the relationships between both the Admissions Testing Program (ATP) SAT and Achievement Test scores and the type and level of coursework in six academic areas. In order to provide a more accurate representation of these relationships, the data were adjusted to account for differences related to student academic achievement. The results show that coursework in the disciplines of mathematics, natural science, and foreign languages has the strongest adjusted relationships with SAT-mathematical scores. SAT-verbal scores appear to be most strongly related to the number of years of foreign language coursework. These relationships are generally consistent across ethnic groups and income levels. However, it appears that the relationships are stronger for students with higher grade-point averages. The specific courses that seem to be most strongly related to SAT performance are upper-level courses in mathematics, natural science, and foreign languages. The specific course relationships appear stronger for male than for female examinees. An analysis of Achievement Test data again indicates that upper-level coursework in the three previously mentioned academic areas is most strongly related to performance on the Achievement Tests. All the research findings must be qualified because the study was exploratory. Student participation in the various courses was based solely on the motivation and the opportunity of the students to take the courses. As a result of this self-selection, causal interpretations of the results are not appropriate.

INTRODUCTION

The Scholastic Aptitude Test (SAT) is intended to be insensitive to short-term curriculum effects. Nevertheless, it is reasonable to assume that schooling may develop the abilities measured by the SAT. If, in fact, high school coursework does influence SAT results, then it is important to school counselors, educators, students, and measurement professionals to determine which, if any, courses or types of courses are related to successful performance on the SAT.

The research investigating achievement tests has identified the obvious positive relationships between the number of years and type of coursework in a discipline and achievement test performance in that discipline (e.g., Denham and Lieberman 1980; Welch, Anderson, and Harris 1982). Recently, Schmidt (1983) demonstrated the existence of differential strengths of relationship across subject areas. The effect of coursework on achievement test scores in mathematics was strongest, while the relationships between coursework and performance on reading and vocabulary tests were the weakest. Jones, Davenport, Bryson, Bekhuis, and Zwick (1986), using longitudinal data from the sophomore cohort of the 1980 High School and Beyond survey, found a strong relationship between scores on a senior mathematics achievement test and the number of mathematics courses taken at the level of first-year algebra and beyond. Three covariates, sophomore mathematics achievement, socioeconomic status (SES), and verbal ability, were then used to permit the attribution of performance differences to course-taking differences rather than to differences in student ability. The adjustment for the covariates reduced the size of the relationship between mathematics coursework and mathematics achievement; however, the relationship was still substantial. A much weaker relationship was found for a science achievement test performance and the number of science courses taken.

Using college admissions testing data, Laing, Engen, and Maxey (1987) demonstrated a general relationship between more coursework and improved ACT (American College Testing Program) performance. The strongest relationships linked mathematics and natural science coursework with the corresponding ACT subscales. The study, while controlling for sex and ethnic differences, did not investigate or control for effects of coursework in one discipline upon another discipline's subscale. For example, the relationship between the number of years of English coursework and the social science subscore was not investigated. Furthermore, the strength of the relationship between social science coursework and the social science subscale, after taking into account the number of English courses, was not investigated. It may be that English coursework or the coursework in any other discipline is as or more important than social science coursework to successful performance on the ACT social science test.

Recently, Cooper (1987) examined the relationships between the number of years of foreign language study and SAT-verbal performance for students in a large Southeastern school district. Using each student's seventh-grade California Achievement Test reading subscore as a covariate, an adjusted difference of over 60 points was found between those who took four years of a foreign language and those with no foreign lan-

guage coursework. Increments of 10 to 20 points were found for each additional year of study from zero to four years. Cooper also examined the adjusted means for each of four different languages and concluded that those taking German achieved the highest adjusted SAT-verbal scores, followed by those taking French, Latin, and finally Spanish.

Binkley and Jackson (1979) explored the relationships between level of coursework and SAT performance based on samples of over 5,000 black and 5,000 white examinees. The analyses examined the relationships between the number of years of coursework in six academic areas and SAT scores, controlling for father's education, income, and high school rank. Based on regression analyses, the number of years of foreign language coursework was most strongly related to SAT-verbal performance. Mathematics coursework was related most strongly to SAT-mathematical performance, followed by physical science and then foreign language coursework.

One purpose of the present study was to explore further the line of research initiated earlier by Binkley and Jackson using a more recent, more diverse, and larger sample. A second goal was to investigate the relationships between the number of years of coursework in various disciplines and SAT performance for ethnic, income, and ability groupings. A third aim of this study was to examine the relationships of SAT performance and coursework in specific courses, such as geometry and chemistry. Finally, the relationships between ATP Achievement Test performance, work in specific courses, and the level of coursework within related disciplines were investigated.

The research findings must be interpreted in light of the fact that the research was nonexperimental. The samples of students taking various courses were not random. For example, more able mathematics students are more likely to take advanced mathematics courses. Thus, the effects of coursework and the effects of variables relating to the decision to take certain courses are confounded and become indistinguishable. The focus of the data analyses, therefore, was not in drawing causal inferences, but rather on searching for patterns in the data.

METHOD

Sample

The data source for all analyses was the 1987 National College-Bound Seniors tape consisting of a sample of 100,000 students from the class of 1987. The sample reflects the proportional representation in the ATP registration population of all combinations of sex and ethnic groups. Only the examinees who identified themselves as taking the SAT during their senior year were included in the analyses. All examinees who last took the SAT prior to their senior year were removed from the sample so the responses to the SDQ items would reflect courses taken or being taken, rather than anticipated coursework not yet undertaken. As a result, the sample size was reduced to 74,591.

Variables Analyzed

The National College-Bound Seniors tape contains responses to SDQ items along with the corresponding most recent test scores for each examinee. Due to the overwhelming number of variables, a decision was made to limit the analyses to three types of variables. The first set of variables measured the number and type of courses taken by students in the disciplines of art and music, English, foreign languages, mathematics, natural science, and social science. These variables, in general, served as predictor variables. The second set of variables provided the score information for the SAT and the Achievement Tests. These variables served as criterion variables. The third set of variables contained background information that could have affected the relationships between coursework and test performance. It included only variables which had known relationships with SAT scores and which, if left uncontrolled, could distort the results. This set of variables served as covariates. The size of the covariate set was limited to facilitate data analysis and interpretation. The background variables selected for inclusion were ethnic group, sex, parental income, and estimated high school grade-point average.

Two of the variables required the quantification of qualitative categories. The first indicated the number of years of study in a subject or discipline. The last level of this variable contained a category labeled 4+ years. This category was assigned the value of 4.5 years. The second variable, student-reported grade-point average, contained all qualitative categories (A+, A . . . D, F). The assignment of quantities to the grades was based on the midpoints of the intervals provided for each grade on the SDQ. As a result, the following values were derived:

A + = 98.5	A = 94.5	A − = 91.0
B + = 88.0	B = 84.5	B − = 81.0
C + = 78.0	C = 74.5	C − = 71.0
D + = 68.0	D = 64.5	F = 61.0

Student-reported grade average was selected over student-reported rank as a measure of high school achievement because fewer than 200 students did not provide an estimated grade-point average (GPA), while over 5,000 students did not provide an estimated class rank. The correlations of estimated class rank and

estimated grade-point average with both predictor and criterion variables were very similar.

Data Analysis

In an effort to provide information about the relationships between coursework and test performance that was not totally confounded by outside variables, linear regression and analysis of covariance were used to describe the relationships that existed between coursework and test performance, after the effects of a small set of known covariates had been removed.

Variables were controlled using two distinct methods. In order to control for background variables associated with test scores, many analyses were conducted separately within sex, ethnic, and income groupings. These three background variables, however, do not totally control for the differences in level of general academic ability. In order to partially control for this unobservable variable, self-reported grade-point average served as a substitute. Self-reported grade-point average was statistically controlled by the use of linear regression. The analyses also used linear regression to statistically control for the level of academic coursework outside the discipline or course under investigation. Control of this variable was intended to limit the relationship between coursework and test scores to the courses or discipline under investigation by removing variation in the test scores related to work in other courses or disciplines. This covariate allowed for the examination of the relationship between specific types of coursework and SAT performance after adjusting for disproportionate distributions in the level of coursework in other academic areas.

The path diagram in Figure 1 shows that the analyses investigated the relationship between work in a specific course or discipline and test performance, after using linear regression to account for variation in the test scores related to general academic achievement (as measured by GPA) and other academic coursework. Multiple covariance analysis was employed to examine the relationships between coursework and test performance, following the simultaneous adjustment of the covariates. Analysis of covariance was performed separately for each coursework level, unless the regression structure failed to differ over the coursework levels.

Significance tests are conspicuously absent from the analyses because, due to the large sample sizes, all but the most trivial differences were statistically significant. Any correlation or regression weight that was *not* statistically different from zero at the .01 level is so indicated by an asterisk. In place of a series of significance tests, tables describe aspects of the association between coursework and test scores, after linear regression has adjusted for GPA and outside coursework.

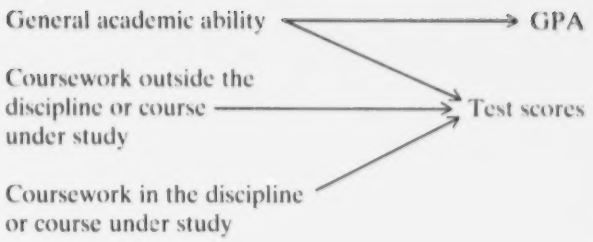
General academic ability
GPA
Coursework outside the discipline or course under study
Test scores
Coursework in the discipline or course under study

Figure 1. Path Diagram Outlining Analyses

The focus of these tables is generally on providing covariate adjusted means for the varying levels of coursework. The focus of all the data analyses is on examining patterns of results, rather than emphasizing specific findings.

RESULTS

Analyses of SAT-V and SAT-M Scores

Four sets of analyses were conducted to examine the relationships between coursework and SAT performance. The first set of analyses investigated the relationships between the number of years of study within each of the six academic disciplines and SAT scores. The six disciplines of study were art and music, English, foreign languages, mathematics, natural science, and social science. The corresponding tables provide covariate adjusted mean SAT scores for examinees reporting varying numbers of years of coursework in each discipline. The second set of analyses explored the relationships between coursework in the six disciplines and SAT performance, within ethnic groupings and income levels. To permit easy comparison of the results across ethnic groups and income levels, the tables provide partial correlations between the years of coursework within each discipline and SAT scores for each ethnic group and income level. The third set of analyses subdivided the sample into three levels of both GPA and total academic coursework. To facilitate comparison and also to provide information concerning the relative contribution to SAT performance of a year of coursework in each discipline, linear regression weights for a year of study in each discipline within each coursework and GPA combination are provided. The final set of analyses in this section studied the relationship between SAT scores and taking specific courses. The tables provide the covariate adjusted SAT mean score differences between those who did and those who did not report taking particular courses. In all cases an asterisk signifies the absence of a statistically significant relationship between number of years of coursework and SAT performance.

Analyses According to Discipline

The first set of analyses examined the relationships between the number of years of study within each of the six disciplines and performance on the SAT. The data measuring years of study in each discipline were taken directly from SDQ questions. Analyses were conducted separately for males and females, due to gender differences in both SAT scores and the number of years of high school coursework within disciplines. Analysis of covariance was utilized to provide estimates of the mean SAT performance for each of the levels of coursework (0 to 4+ years) completed in a discipline. The analyses simultaneously adjusted for the linear effects of two covariates. The covariate regression weights varied across the number of years of study in a discipline, for each of the six disciplines. Consequently, the assumption of homogeneity of covariate regression slopes was violated. As was the case in Jones et al. (1986), the analyses of covariance were executed separately for each level of coursework completed. Therefore, the tables provide covariate adjusted SAT scores using different covariate regressions for each level of coursework, within each discipline.

Two covariates were utilized in the analyses. The first covariate represented the reported number of years of coursework outside the specific discipline under study. For example, if the relationship between English courses and SAT-verbal scores was the focus, the covariate took on the value of the number of years of study in the other five disciplines. This covariate was used for a number of reasons. First, positive relationships existed among the number of courses completed in the six disciplines (median = .17). Second, the correlations between the total number of years of coursework and SAT-V and SAT-M scores were both .39. Furthermore, this variable may have also provided another measure of the unobservable variable of general academic achievement. Therefore, the inclusion of this covariate removed the covariation in the SAT scores related to the number of years of coursework in other disciplines and allowed a more direct examination of the relationship between the level of coursework in a specific discipline and SAT performance. The reported number of years of study outside the specific discipline was preferred to the total number of academic courses as a covariate, in order to avoid using a covariable that was defined as the sum of six variables, one of which later entered as a predictor variable.

The second covariate was the self-reported GPA. The GPA information was provided by the examinee who selected one of the 12 grade-point average categories on the SDQ. Self-reported GPA was used as a covariate because students obtaining higher grades tend to take more academic courses and also to receive higher SAT scores. In this sample, the correlations of self-reported GPA with the total number of academic courses, SAT-V, and SAT-M were .30, .45, and .50, respectively. The removal of variation related to GPA presumably enabled a more accurate examination of the relationship between coursework in a discipline and test performance. The use of the student-reported GPA as a covariate can be criticized because it was a measure of achievement that included the very courses which were being assessed. One alternative would have been to use GPAs based only on classes outside the courses or discipline under study. This solution would have been possible for the sets of analyses investigating years of study within a discipline, but impossible when specific courses were being evaluated. It was believed that the benefit to the analyses which resulted from the use of the same SDQ-reported GPA for all analyses outweighed the liability of using a potentially slightly contaminated measure of GPA, especially when the alternative would have resulted in the lack of a GPA covariate for many of the analyses.

The choice of these two covariates was an attempt to remove some of the effects caused by student self-selection of courses. By no means, however, did the covariates control for all of the self-selection factor. Unless the selected covariates are perfectly correlated with the variables that lead to the selection of courses, the use of the covariates can only provide an adjustment that moves in the right direction, but that remains an undetermined amount away from perfect adjustment. As a result, it is important to view all results as descriptive of relationships in a partially uncontrolled environment rather than as causal in origin.

Table 1 displays the mean SAT-V scores for students grouped according to the number of years of art and music courses reported. The table shows the number of examinees who reported each level of coursework completed, followed by four sets of means. The first set of SAT-V score means shows the unadjusted (observed) means for students reporting 0 to 4+ years of coursework. The next column contains the means adjusted to remove the linear effects of coursework in academic areas other than art and music and also the effect of academic achievement, as measured by GPA. The last two columns present the means for the two covariates, SDQ-reported GPA and number of years of coursework outside the discipline. The upper part of the table provides means for male examinees, the lower part for females. Appendix 1 shows the standard deviations of the SAT scores for the students at all reported levels of coursework for each discipline.

The first 12 tables follow the format of Table 1, with unadjusted and adjusted means shown for examinees grouped according to the number of years of coursework in a discipline. Coursework categories with less than 100 students were collapsed into categories of at least 100 students. The tabled means are based on weighting the means of the collapsed categories by their

sample size. The art and music category is presented first, because a 1987 College Board report indicates that these subjects may have the weakest relationship with SAT scores.

As expected, for both the unadjusted and adjusted means, Table 1 displays a weak positive relationship between SAT-V performance and the number of years of study in art and music. For both male and female examinees, the difference in the adjusted means between those with no coursework and those with more than four years of coursework in these subjects is less than 30 points. Due to the very low correlations between the number of art and music courses taken and both the SDQ-reported GPA (r=.04) and the level of coursework in outside disciplines (r=.08), the adjustments of the SAT-V score means based on the values of the covariates are minor.

Table 2 presents the unadjusted and adjusted SAT-M score means for the level of coursework in art and music. The relationship between years of coursework and SAT-M performance was even weaker than it was for the SAT-V. Those students with three or more years of coursework in art scored only marginally higher on the SAT-M than those with one year or less of coursework.

Table 3 displays the data summarizing the relationships between years of study in English courses and SAT-V performance. The unadjusted means indicate a positive relationship between years of English study and SAT-V performance. Students reporting more than four years of coursework scored more than 40 points higher than those with fewer than four years. However, when the data are adjusted for the number of years of non-English coursework and the self-reported GPA, a different picture emerges. Following the covariate adjustment, little, if any, relationship between the variables remains. For female examinees the highest adjusted SAT-V score mean is for less than three years of English coursework. For male examinees those reporting three years of coursework have the highest adjusted SAT-V score mean.

A similar set of results is found for the English coursework variable and the associated SAT-M performance. Table 4 shows that while the unadjusted mean scores for the SAT-M are higher for those with more years of English coursework, the adjusted means indicate that those examinees with less English coursework perform slightly better on the SAT-M. This finding, however, should be qualified, since less than six percent of the students reported taking three or fewer years of English.

Table 5 presents the data summarizing the relationships between years of study in foreign language courses and SAT-V scores. Unlike the previous disciplines examined, a nontrivial relationship exists between SAT-V performance and years of foreign language study. The adjusted means indicate that those with four or more years of foreign language coursework averaged over 70 points higher on the SAT-V than those with one year or less of coursework. Furthermore, increments of approximately 20 points appear for each additional year of coursework.

Table 6 presents comparable data for SAT-M scores. Although the relationship between the level of foreign language coursework and SAT-M performance is not quite as strong as it was with SAT-V performance, again nearly 70 points separate the adjusted means of those taking four or more years of foreign language coursework from those who took one year or less. As with SAT-V scores, the relationship between foreign language coursework and SAT-M performance appears slightly stronger for females than for males.

Table 7 clearly demonstrates the importance of adjusting for the covariates. This table shows that without such adjustment, the difference in SAT-V scores between those reporting less than two years of mathematics and those reporting four or more years is greater than 80 points. However, when the relationships involving GPA and coursework outside of mathematics are considered, the adjusted difference in the SAT-V score is less than 40 points for males and less than 10 points for females. For females reporting more than two years of mathematics, the level of mathematics coursework appears unrelated to SAT-V scores.

As expected, Table 8, which displays the relationships between mathematics coursework and SAT-M performance, presents a different story. The adjusted means indicate that those students with four or more years of mathematics scored well above those students with less than two years, or even three years. In sum, the analyses found little relationship between mathematics coursework and SAT-V scores, but a sizable relationship between SAT-M scores and the level of mathematics coursework.

The relationships between SAT-V performance and the number of years of natural science coursework are shown in Table 9. The adjusted means point to a relationship between natural science coursework and SAT-V performance. The adjusted means for four or more years of coursework are nearly 40 points higher than those for less than two years of coursework.

Table 10 presents the data outlining the relationships between natural science coursework and SAT-M performance. Following adjustment for the covariates, male students with four or more years of coursework have adjusted means over 60 points higher than those with less than two years. The adjusted difference for females is not as dramatic. Clearly, natural science coursework is more strongly related to SAT-M than to SAT-V performance. For both the mathematics and natural science data, the relationship between coursework and performance on the SAT appears stronger for males than females.

The unadjusted and adjusted means for the verbal section of the SAT for social science coursework can be found in Table 11. The unadjusted means display a positive relationship whereby higher verbal scores are associated with more years of social science coursework. The adjusted means show that a weak relationship exists between social science coursework and SAT-V performance when the covariables are considered. The adjusted means in Table 12 show little relationship between social science coursework and SAT-M scores.

Clearly, the two subjects for which the level of coursework was most strongly related to performance on the verbal section of the SAT were foreign languages and, to a lesser extent, natural science. The three disciplines in which more years of coursework were associated with meaningful improvement in SAT-M performance were mathematics, natural science, and foreign languages. These results, however, do not imply that coursework in mathematics, natural science, and foreign languages directly results in improved SAT performance. It could well be the case that students who were likely to score well on the SAT took more courses in mathematics, natural science, and languages and that the relationships exhibited resulted from self-selection of courses. For example, it is difficult to explain why students who took more foreign language courses scored significantly higher on the mathematics section without considering self-selection. Therefore, it appears that the covariates may not have accounted for all of the influence of self-selection of courses.

Analyses by Ethnic Group and Income Level

Analyses were conducted within ethnic groups and income levels in order to determine whether the relationships between SAT performance and number of years of coursework in the six disciplines were consistent over these groupings. These analyses allowed some control for economic and ethnic factors that may have affected test scores in some way other than through courses taken. Furthermore, these analyses within ethnic groups and income levels may validate the previous set of analyses and also might determine if ethnic or economic groups display differential relationships between coursework and SAT performance. Due to the 48 combinations of ethnic groups and disciplines, the degree of the relationship between coursework in a discipline and SAT performance for each combination was summarized using a partial correlation. The tables report partial correlations based on linear relationships, because nonlinear second order regression terms for the coursework variable generally showed trivial nonlinear effects.

Table 13 presents the partial correlations of SAT-V scores with level of coursework in each discipline after partialing out the two covariates, student-reported grade-point average and the number of courses taken outside the discipline. The pattern of partial correlations is very consistent across ethnic groups and income levels for each discipline. For all ethnic groups, except Mexican American examinees, the coursework variable most strongly related to SAT-V performance is foreign language. With the exception of the Puerto Rican examinees, the level of natural science coursework has the second highest partial correlation. Little relationship is found between the number of years in the discipline and SAT-V scores when considering the level of English and mathematics coursework. All three groups of Hispanic examinees, however, display positive, albeit statistically insignificant, relationships between level of English coursework and SAT-V performance. All but one of the ethnic groups show a very slight positive relationship between SAT-V performance and years of coursework in both social sciences and art and music. The largest partial correlation relates the performance of black examinees to foreign language coursework. Together, the ethnic group data and income level data tend to support the earlier analyses.

Table 14 displays the partial correlations for the mathematics section of the SAT. The numbers clearly indicate that mathematics, natural science, and foreign languages are the disciplines most strongly related to SAT-M performance. The level of mathematics coursework shows the strongest relationship for the three Hispanic groups and for American Indian and white examinees. SAT-M performance is most highly related to natural science coursework for Asian American examinees, while the level of foreign language coursework was the most highly related variable for black examinees. For both Tables 13 and 14 the partial correlations within the three income levels show little deviation. Again the ethnic and income data seem to replicate earlier findings.

Analyses by GPA and Level of Coursework

To further examine the relation of level of coursework to SAT performance, a third set of analyses was conducted. The analyses subdivided the sample into three levels of self-reported GPA and three levels of semesters of academic coursework outside the discipline under examination. To provide information concerning the impact of coursework on SAT performance, linear regression weights for years of study within each of the nine coursework levels by GPA levels were estimated. The analyses examined whether these unstandardized regression weights were differentially larger for students with varying strengths in academic background and academic performance. For example, coursework in one particular discipline may be more beneficial to less able students, while coursework in another discipline may be more beneficial to more able students. Further, coursework in a particular discipline may be especially important to students with a limited number of academic courses.

The three groupings of examinees based on self-reported GPA are

1. those reporting A-minus to A-plus GPAs
2. those reporting B-minus to B-plus GPAs and
3. those reporting GPAs below B-minus

The three groupings of examinees based on level of coursework are

1. 34 or more semesters of coursework outside the discipline under scrutiny
2. 27 to 33 semester hours of coursework outside the discipline under scrutiny
3. fewer than 27 semester hours of outside coursework

Nonlinear regression techniques were not utilized, because of the linear patterns established in the earlier analyses. Nor were partial correlations provided in these analyses, since the categorization of GPA and total coursework served as controls for the covariates.

Table 15 presents the linear regression weights relating years of study in each academic discipline to SAT-V performance for female students within each combination of level of coursework and self-reported GPA. Several findings stand out. First, as anticipated from earlier results, the linear regression weights for foreign language coursework are the largest in all nine combinations of outside coursework and GPA. Natural science coursework generally has the second largest regression coefficient. Second, the linear regression weights are generally the smallest for the students with 34 or more semesters of coursework outside the discipline. This was especially true for social science and art and music coursework. Third, the regression coefficients are generally the largest for the more able students, with the C average or lower students clearly having the smallest regression weights for all disciplines.

Table 16, which displays linear regression weights pertaining to SAT-V scores for males, presents data similar to that in the previous table. As with female students, male examinees with higher grades and those with fewer reported years of coursework seem to show the largest regression weights.

The summary of the regression weights for female examinees on SAT-M performance is displayed in Table 17. One striking feature of the table is the size of the regression weights for mathematics. The three weights for the A students are all above 45 points. Furthermore, the weights for the mathematics variable are much larger for the A students than the C students. Additionally, the weights for the A students are approximately twice the weights of the C students for natural science coursework. As with the previous two tables, the regression weights are generally larger for those students with the fewest semesters of coursework and for the students with higher grade-point averages.

In general, the observations in Table 17 are corroborated in Table 18, which displays data for male examinees. The linear regression weights are higher for males than for females in the mathematics and natural science areas. The weights associated with English coursework are more negative for male examinees than female examinees.

Several hypotheses can be offered to explain the finding of larger regression weights for students with higher reported grade-point averages. One possibility is that more able students may benefit more from any course taken. This would result in larger regression weights for more able students for any combination of courses. A second possibility is that better students may be taking courses that are more challenging or courses that have a greater impact on SAT performance. In order to investigate the second hypothesis further, the next set of analyses examined the relationships between individual courses and SAT performance.

Analyses by Course

The previous sets of analyses focused on the relationships between the level of coursework in a discipline and SAT performance. The analyses of this section focus on individual courses within the six disciplines. The tables compare the SAT performance of those students indicating they had taken or were taking a particular course with that of students who indicated they had not taken the course. Only examinees providing information for all courses were included in the analyses.

The tables to follow present six columns of data. The first column shows the number of students who reported taking each course. The second column displays the SAT mean score for the examinees reporting coursework in each subject area. The third column shows the difference between the unadjusted means for those who did and did not indicate work in a subject area. For example, if those examinees indicating coursework in art history had an SAT-V mean score of 445 and those indicating no work in art history had an SAT-V mean score of 437, the SAT-V mean score difference appearing in the table would be 8. The fourth column shows the difference between the means, following statistical adjustments, based on the courses taken within the discipline, the level of coursework in outside disciplines, and the SDQ-supplied grade-point average. All adjusted mean differences were based on an analysis of covariance, which simultaneously adjusted for the covariates separately for each subject area. The analyses utilized separate covariate regression weights when comparing those indicating work in a course and those indicating no work. The mean difference represents the difference in the adjusted SAT scores of the examinees who reported taking the course and those who indicated they did not take the course. The last two columns provide covariate means for the examinees taking

the indicated courses. These last two columns provide some information concerning the ability levels of students indicating coursework in the tabled courses. Appendix 2 provides the standard deviations of the SAT scores for all the courses analyzed in this section.

Table 19 provides two sets of mean SAT-V score differences for eight art and music courses. The third column shows the differences in the SAT-V mean scores of those in the sample that did and did not indicate work in the courses listed. The fourth column of data displays the differences in means after adjusting for the level of coursework outside art and music, the type of art and music coursework taken, and the self-reported GPA of the student. The reduction in the mean differences resulting from the use of the covariates illustrates the importance of considering covariates. The table specifically shows that for both male and female students most of the courses have positive mean differences in favor of the students taking the courses. The adjusted mean differences for most of the courses are less than 20 points. The largest adjusted difference is 29 points for acting.

The mean differences in the SAT-M average scores for each of the art and music courses are listed in Table 20. In general, the adjusted mean differences are smaller for the SAT-M than the SAT-V and, again, generally consistent for the two sexes. Acting, photography, and studio art show the largest differences. Differences found for art history, dance, and drama appreciation are negative. Negative differences indicate that the higher scores were associated with those not taking the course. For both sections of the SAT, the sizes of the adjusted mean differences are small. Again it is important to note that students self-select all courses and that the use of covariates cannot totally account for this factor.

Table 21 presents the unadjusted and adjusted SAT-V mean score differences based upon responses concerning coursework in English. The two areas of coursework which show negative adjusted differences are grammar and English as a second language. Obviously, students for whom English is a second language have a built-in handicap when taking any test which measures English vocabulary and reading comprehension of passages written in English. The course with the largest adjusted mean difference is British literature.

The data for specific English classes and their relationship with SAT-M performance are displayed in Table 22. As would be expected, the adjusted mean differences for English as a second language are much closer to zero than with the SAT-V, because the mathematics section is less dependent on reading and understanding English vocabulary. In general, all the adjusted differences are smaller for the SAT-M, with British literature and composition showing the largest differences.

Tables 23 and 24 display data relating differences in performance on the SAT with enrollment in foreign language courses. Table 23 provides data for SAT-V scores. Two features of the table are striking. First, the adjustment for the covariates resulted in the mean differences for Italian and Spanish coursework reversing, from favoring those not taking these courses to favoring those taking them. This reversal was because students with comparatively lower grade-point averages elected to study these two languages. Second, in general, the sizes of the adjusted mean differences are substantial, with most of the differences greater than 30 points.

Table 24 shows the data on SAT-M performance. Generally, the adjusted mean differences are sizeable, although not quite as large as for the SAT-V. One point is worth reflection. The adjusted mean SAT-M score differences for the eight languages listed vary considerably. It is difficult to understand why a course in one language would add more to SAT-M performance than another, if the adjusted differences only included coursework effects. Therefore, it appears that the use of the covariates may not have been successful in controlling for all the variation in the SAT scores due to noncoursework variables.

Table 25 displays data relating mathematics coursework to SAT-V performance. After adjustment for the covariables, those examinees with coursework in geometry, precalculus, and calculus scored significantly higher than those without coursework in those subjects. The large adjustments in the mean differences from the third to fourth columns in Table 25 give an indication of the strength of the relationship between coursework in mathematics and both high school grade-point average and SAT scores. The covariate means clearly show that calculus and precalculus were taken by the most able groups of examinees.

Table 26 presents data concerning the relationship of particular mathematics courses to the mathematics section of the SAT. The size of the adjusted means very clearly shows significant relationships for coursework in geometry, trigonometry, precalculus, and calculus. A curious finding was the absence of a relationship for coursework in algebra, since a major content area of the SAT-M is algebra. An examination of the 64 possible coursework patterns for the six mathematics variables revealed that several of the students reporting no coursework in algebra indicated coursework at the level of precalculus and calculus. These 265 students averaged 617 on the SAT-M and 508 on the SAT-V. This group of examinees simply may not have included algebra coursework taken before high school when responding to the algebra question. Another group of examinees reporting no algebra coursework reported no mathematics coursework beyond the level of geometry. This group of 466 students averaged 315 on the SAT-M and 310 on the SAT-V. As a result of the wide variation in the mathematics backgrounds of the students reporting no algebra coursework, the standard deviation of

SAT scores for the group reporting no algebra coursework is very high. Less than two percent of the examinees responding to the mathematics coursework questions on the SDQ reported no algebra coursework. The net result is that the algebra data should probably not be interpreted as indicating that algebra coursework has a negative effect on SAT-M scores.

Table 27 summarizes the differences in SAT-V performance relating to coursework in five natural science subjects. Even following adjustment for the covariates, those taking chemistry and physics scored 16 to 35 points higher on the verbal section than those who did not take these two courses. Marginal differences are indicated for the other three courses.

As expected, Table 28, which shows the relationships between natural science coursework and SAT-M performance, indicates larger adjusted mean differences for those courses than did the previous table. Specifically, SAT-M score differences for chemistry and physics are considerably larger than the SAT-V differences, while the other three courses listed show similar mean differences to those found for the verbal score.

The results of the mathematics and natural science individual course analyses support two earlier findings. In general, the mean differences for mathematics and natural science courses are larger for male examinees than for females. This finding supports earlier analyses which found larger yearly increments in the mathematics and natural science disciplines for male examinees. Also, earlier analyses found that examinees with higher self-reported grade-point averages exhibited larger regression weights. In the analyses in this section, courses with the highest grade-point averages, for the most part, showed the largest mean differences. Still, it was not possible to determine whether the latter finding resulted from higher-level courses actually enhancing SAT performance or whether the higher achieving students developed more skills measured by the SAT from any course taken.

Tables 29 and 30 provide information relating differences in SAT score means to enrollment in social science courses. In both tables the differences are small, generally not statistically significant, and in many cases negative. European history, anthropology, and psychology are the only courses for which, in all four tables, the mean differences favor those taking the courses. For these three courses, the largest adjusted mean differences are less than 20 points.

Analyses of Achievement Test Scores

Eight Achievement Tests were chosen for analysis. The goal was to examine the relationships between coursework and Achievement Test scores. The tests analyzed were the higher volume ones from the disciplines of English, foreign languages, mathematics, natural science, and social science. Due to the smaller sample sizes for the Achievement Tests, the data for male and female examinees were analyzed together. The relationships between coursework and Achievement Test scores would be expected to be stronger than those between coursework and SAT performance, because the SAT, unlike the Achievement Tests, is not a test of achievement in a single subject area. The analyses focus on providing unadjusted and covariate adjusted mean scores for various levels of coursework in the five subject areas. The tables also provide adjusted mean differences comparing those students who reported taking certain related courses with those who did not. The choice of related courses was based primarily on the courses listed in the background questionnaire for each Achievement Test.

The analyses of the relationships between Achievement Test performance and related coursework allow for indirect comparisons of the adjusted mean differences for SAT scores and Achievement Test scores. The Achievement Test adjusted mean score differences are based, as were earlier estimates, on separate covariate regression weight estimates for each level of coursework. Self-reported grade-point average, the number of courses in outside disciplines, and the number of courses in the discipline served as covariates. The analyses also provided linear regression coefficients for years of work in the subject area examined. Finally, the standard deviations for the Achievement Tests for the courses and levels of coursework indicated in the tables are provided in Appendix 3.

Natural Science

The two natural science tests chosen for investigation were Biology and Chemistry. Table 31 summarizes the findings for the Biology Achievement Test. The upper half of the table shows the unadjusted and adjusted means for examinees reporting three different levels of coursework in biology. Years of biology coursework were positively related to test scores. The regression weight for years of coursework in biology was nearly 40 points. The second half of the table displays adjusted means for the natural science and mathematics courses listed in the background questionnaire for the Biology Achievement Test. The adjusted means show that after accounting for variance relating to GPA and coursework, students reporting higher level coursework in mathematics and coursework in physics and chemistry scored higher in the Biology Achievement Test than those without coursework in these areas. The mathematics coursework mean differences, with the exception of geometry and trigonometry, were larger than the differences found in Table 25 for SAT-V scores and smaller than the SAT-M score differences shown in Table 26. The chemistry and physics differences were

nearly equal to those found for the SAT-V in Table 27 and smaller than the differences found for the SAT-M in Table 28.

Table 32 follows the format of Table 31, and provides data for the Chemistry Achievement Test. The upper half of the table indicates that those with more years of coursework in chemistry had relatively larger gains on the Chemistry Test than those with more years of biology had on the Biology Test. The pattern of the adjusted mean course differences is similar to that found in the preceding table. Because there were insufficient numbers of students who had not taken biology, biology was not included in the list of related courses.

Mathematics

Both mathematics achievement tests were analyzed. Table 33 presents data for the Level I Mathematics Test. The upper part of the table indicates that students with four or more years of mathematics coursework scored significantly higher than students with fewer than four years. The regression coefficient for years of mathematics coursework, adjusted for all coursework and freshman grade-point average, is over 40 points. The lower half of the table shows that the adjusted mean score differences are largest for calculus, with sizeable mean differences for trigonometry and precalculus.

The data for the Level II Mathematics Test are found in Table 34. The adjusted coursework regression coefficent of 30 points is smaller than the regression weight for the Level I test. The lower half of the table indicates that, with the exception of calculus, the mean adjusted differences for specific courses are less for the Level II test than for the Level I. This finding makes sense, since approximately 75 percent of the questions refer to algebra, geometry, and trigonometry on the Level I test, while only slightly more than half of the Level II test refers to these areas. Of note in both tables are the negative differences for geometry. These negative differences, like the earlier ones found for algebra in relation to SAT-M scores, are likely due to several high scoring examinees reporting coursework in calculus and precalculus, but not geometry. The negative differences for geometry illustrate both the problems inherent in the use of self-reported course information rather than actual transcript information and the inability of any group of covariates to account for all the differences in the composition of groups based on nonrandom sample selection.

Foreign Languages

The French and Spanish Achievement Tests were analyzed. Only students who indicated that English was their first language were included in the analyses. The number of students for these analyses was considerably smaller than for the SAT analyses or the other achievement test analyses. Table 35 shows the relationship between coursework in French and performance on the French Achievement Test. Clearly, a positive relationship exists between scores on the test and level of coursework in French, with years of French having a regression weight of over 45 points.

Table 36 displays the Spanish Achievement Test data. The relationship between coursework and achievement test performance is not as strong as for coursework in French. Years of Spanish instruction has a regression weight of 25 points. It is interesting to note that the 21-point regression weight differences between the French and Spanish Achievement Tests nearly parallels the mean differences found in Tables 23 and 24 with regard to SAT performance. The difference between the French and Spanish regression weights again points to the nonexperimental nature of the data. It seems reasonable, all else equal, for the regression weights of two languages as similar in origin as French and Spanish to be approximately equal. Some of this regression weight difference may be accounted for by more able examinees taking French.

Social Science

Table 37 presents the data for the American History Achievement Test. The upper part of the table shows the adjusted and unadjusted means for examinees taking one year of American history compared with those reporting more than one year. Those with more than one year performed better than those with only one year. The regression weight for a year of American history coursework is 25 points. The lower part of the table shows the adjusted mean differences for other related social science courses. Those students who reported having taken courses in European history and ancient history performed better on the American History Achievement Test. These findings somewhat parallel the corresponding data with regard to SAT-V scores in Table 29, where European history was the social science course for which the data most favored those taking the course.

English Composition

The last achievement test analyzed is the English Composition Achievement Test. The upper portion of Table 38 indicates that the level of coursework in English is marginally negatively related to the adjusted mean performance on the test. The lower portion of the table examines the mean differences for seven subject areas within English. Both the upper and lower portions parallel the SAT-V score data found in Tables 3 and 21. As in Table 3, a trivial relationship is found between the level of English coursework and test scores. As in Table 21, positive mean adjusted differences for individual courses are found.

Direct Comparison of SAT, TSWE, and Achievement Test Scores

The comparisons made of adjusted coursework differences for the Achievement Tests and the SAT are not direct comparisons. The population of Achievement Test examinees is a more able subset of the SAT examinee population. Any differences in the relationships between coursework and test performance may be due to population differences. In this section all comparisons of SAT and Achievement Test performance are based on the same samples of examinees. These samples are drawn from the population of Achievement Test examinees.

Table 39, which parallels Table 33, compares SAT-M and Level I Mathematics test performance, based on the examinees taking the Level I Achievement Test. The table presents adjusted means, regression coefficients, and adjusted mean differences for comparable levels of mathematics coursework. To facilitate comparing the results of two tests with varying standard deviations, the table also shows the regression coefficients and adjusted mean differences in standard deviation units. In this sample, the standard deviation for the Level I Mathematics test was 90, while the standard deviation for the SAT-M was 96. The table indicates that the regression coefficient, as well as the incremental mean differences among years of mathematics coursework, is slightly larger for the Achievement Test. The adjusted mean differences for the five mathematics courses are generally very similar.

Table 40, which parallels Table 34, compares Level II Mathematics with SAT-M performance by years of coursework in mathematics. The table includes only examinees who took the Level II test. In this sample the standard deviation for the Level II test was 91, while the standard deviation for the SAT-M was 85. As with the previous table, a slightly larger regression coefficient and slightly larger incremental differences for the Achievement Test are found. The adjusted mean differences are generally also a little larger for the Level II test.

The relationships between the English Composition Achievement Test, SAT-V scores, and TSWE, in the sample of English Composition Test examinees, are displayed in Table 41. Table 41 parallels Table 38. The standard deviations were 98 for the ECT, 101 for the SAT-V, and 8.4 for the TSWE. TSWE is on a scale of 20 to 60, rather than a scale of 200 to 800. All three regression coefficients are close to zero. The patterns of the adjusted mean differences, in standard deviation units, for specific courses are consistent for the three tests. For all three tests, American literature, British literature, composition, and literature of historical periods show the largest adjusted differences. In general, the adjusted differences for SAT-V scores are the largest. However, composition shows the largest adjusted differences for the English Composition Test and TSWE. This particular finding is not surprising since both the English Composition Test and TSWE emphasize, in part, skills related to composition. Moreover, the largest mean difference for grammar is for TSWE. Again, this finding is not surprising given that the ability to identify correct grammar is more important to successful performance on TSWE that it is for the SAT-V.

In order to make further comparisons of SAT-V and TSWE scores, two additional analyses were conducted with the sample of SAT examinees. The standard deviations of the SAT-V scores in this sample were 109 for males and 105 for females. For TSWE the standard deviations were 11.0 for males and 10.5 for females. The standard deviations for the SAT-V are essentially 10 times larger than the standard deviations for TSWE. Table 42, which parallels Table 3, compares the adjusted means of SAT-V and TSWE scores for several levels of coursework in the original sample of senior SAT examinees. The table shows that the relationships between the level of English coursework and test performance are similar for the two tests. Table 43, which parallels Table 21, compares SAT-V and TSWE performance with respect to individual courses. With the exception of coursework in grammar, the size and pattern of the adjusted mean differences are very similar. The adjusted means for grammar coursework are consistently higher for TSWE. The pattern of findings is very similar to that shown within the sample of examinees taking the English Composition Achievement Test.

The pattern of marginally negative relationships between the level of English coursework and test scores, coupled with the positive adjusted mean differences for specific English courses, seems puzzling. This may result from the format of the SDQ questions concerning specific English coursework. These questions focus on the content of English courses, rather than on the number of years of work in the content areas. As a result, examinees could have responded affirmatively to several course content descriptions which were taught in a single semester course. Therefore, when an examinee indicates coursework in a specific English content area, there is no indication of the amount of coursework in that area. Consequently, the relationship between the number of English course content areas indicated and the years of English coursework is not necessarily strong.

The SDQ allows the examinee to indicate the amount of coursework in specific courses for foreign languages, mathematics, natural science, and social science. For these subject areas the relationship between the amount of coursework in specific courses and the years of coursework in the discipline should be strong.

DISCUSSION

It needs to be reiterated that this study is a nonexperimental exploration of the data. The sample of students taking any particular course was controlled by course offerings at the high schools and the desires of the students to enroll in the course, not by random selection. The use of the covariates serves to reduce, but not eliminate, the noncoursework differences that exist among students with varying levels of coursework. Therefore, the potential effects of a course on SAT performance and the decision to take the course remain confounded.

One specific finding demonstrates the inability of the covariates to account for the self-selection factor and serves to underscore that the analyses provide an examination of relationships in a largely uncontrolled environment. A nontrivial relationship exists between the level of foreign language coursework and SAT-mathematical performance. Many suggestions, most of them causal, have been offered as to why this relationship exists. For example, it has been suggested that coursework in foreign languages enhances a student's ability to reason logically and that the increase in reasoning power results in higher SAT-M scores. It has also been suggested that academic rigor in one discipline results in higher levels of achievement in other disciplines. These and other theories may account for some of the SAT-M score differences among students with differing levels of foreign language coursework. However, it is most likely the case that the examinees reporting four years of coursework in foreign languages are a motivated group of students who, on the average, possess high levels of mathematical skills. These examinees would have likely obtained higher average SAT-M scores than those reporting no foreign language coursework even without any foreign language coursework. While self-reported grade-point average and the level of coursework in other disciplines provide some measure of academic ability and motivation, they by no means transform a nonexperiment into an experiment.

The general pattern of the results of this study is clear. On the average, students who take more coursework in the areas of mathematics, natural science, and foreign languages earn higher scores on the SAT. Moreover, these patterns are generally consistent across ethnic groups and income levels. It appears that the relationship between the level of coursework and SAT performance is strongest with higher achieving (higher GPA) students. Furthermore, the specific courses that have the strongest relationships with SAT performance are those within the three disciplines of mathematics, natural science, and foreign languages. The courses, such as chemistry and calculus, most highly associated with strong SAT performance are upper-level courses that are taken in higher proportions by higher achieving students. The findings for the ATP Achievement Tests are generally parallel to those for SAT performance. In general, the level of coursework in mathematics, biology, chemistry, French, and Spanish is more closely related to performance on the corresponding subject area tests than is English coursework.

The pattern of results from this study is very similar to earlier reported research findings. For example, in the Cooper (1987) examination of foreign language study, a strong relationship was found between foreign language coursework and SAT-V performance. The Cooper analyses, which included a reading covariate not available in the current analyses, yielded approximately a 60 point difference in SAT-V scores between those students with four years of foreign language coursework and those without any such coursework. The difference in the present study was approximately 90 points, with the comparative differential most likely resulting from the quality of the covariates. Cooper also found that Spanish produced the smallest foreign language course point difference. The same is true for Spanish in the present study. Schmidt (1983) found stronger coursework effects for mathematics coursework than for reading and vocabulary. The present study found significant relationships between mathematics coursework and both SAT-M and Mathematics Achievement Test scores. Little, if any, relationship was found between the level of English coursework and performance on either the SAT-V or the English Composition Achievement Test. Laing, Engen, and Maxey (1987), analyzing ACT data, found the strongest relationships with mathematics and natural science coursework (foreign language coursework was not examined). These same results were found for the SAT in this study. Finally, the findings for the level of coursework within disciplines parallels the findings of Binkley and Jackson (1979), who analyzed a smaller sample of examinees from the class of 1978.

Several other patterns emerged from this study which may provide some explanation for why in 1987 males outscored females on the SAT-V by 10 points and on the SAT-M by 47 points (College Board, 1987). The relationship between the level of coursework and SAT performance was generally stronger in the areas of mathematics and natural science for male examinees than for females. At the level of individual courses, the adjusted mean differences were generally larger for males than for females in mathematics, natural science, and foreign languages. The courses showing the largest male and female differentials were also those in which the larger adjusted mean differences were found. Moreover, males are more likely to take the course with the largest adjusted mean differences (e.g., calculus and chemistry) than females (College Board, 1987). In addition, as Binkley and Jackson found, the coursework relationships are stronger for SAT-M than for SAT-V performance. Burton, Lewis, and Robertson (1988)

have determined that after adjusting for background differences, the score gap between males and females on the SAT-M is halved, while the score gap on the SAT-V is virtually eliminated. Clearly, at least some of the difference between the average SAT performance of male and female examinees results from differences in course patterns and background variables.

Another finding of note is that the subject area with the strongest relationship to SAT performance for black examinees is foreign languages. Interestingly, the average amount of coursework in foreign languages for black examinees has increased by over 30 percent since 1981, while the national average increase is only slightly more than 20 percent (College Board, 1981; 1987). Perhaps this increase in coursework in some way contributes to the 50 point increase in black SAT scores since 1981.

There is a high degree of consistency in the patterns of adjusted mean differences when comparing SAT, TSWE, and Achievement Test results. The English courses with the largest adjusted means for SAT-V performance are also the courses with the largest adjusted means for TSWE and the English Composition Achievement Test. Similarly, the mathematics courses with the largest adjusted means for SAT-M scores are also those courses with the largest adjusted means for the Mathematics Achievement Tests. Additionally, even when comparing samples from different populations, the social science courses with the largest adjusted means for SAT-V performance are also those with the largest adjusted means for the American History Achievement Test. Three explanations for this result are readily apparent. The consistency, in part, results from the degree of correlation between SAT and Achievement Test scores. A second contributing factor is that the covariates utilized might not have successfully controlled for the self-selection of coursework factor. Third, if the actual effect of courses could be measured, it seems reasonable that the courses which impact most upon SAT scores might also be those courses which impact most upon Achievement Test performance.

To what extent do the results for the adjusted means and differences depend upon the use of separate regression solutions rather than common regression solutions for the level of coursework? To answer this, adjusted means and differences were produced under the assumption of homogeneous covariate regression slopes. The adjusted means, using models of homogeneous covariate regressions, varied little from the adjusted means presented in this paper. One third of the adjusted means were identical, while another quarter changed by only one point. The largest differences between the adjusted means were for the level of coursework with smaller sample sizes. The conclusions, then, do not depend heavily on the acceptance or rejection of an assumption of common regressions, an assumption which is violated by very small regression differences in samples as large as the ones used here.

While this study has replicated previous research findings and uncovered new evidence relating to specific courses, it must be understood that these results provide nothing definitive about the direct effects of coursework upon SAT or Achievement Test performance. The covariates used in the analyses were intended to isolate the relationships of interest, but in no way can grade-point average accurately substitute for measures of the verbal or mathematical skills students possess before enrollment in a course. Unless prior measurements of verbal and mathematical skills are made, it is impossible to determine the true effect of coursework in a particular subject area upon SAT performance. Furthermore, even if prior measures of verbal and mathematical skills were available, the problem of student self-selection would not disappear. It would still be impossible to determine how those who did not take a course, due to lack of interest or lack of opportunity, would fare on the SAT following enrollment in the course. However, the author feels that this study represents a first step in exploring the relationship of coursework to SAT performance.

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Table 1. Unadjusted and Adjusted SAT-V Means for Art and Music

Coursework Years	*N*	*Unadjusted Mean*	*Adjusted for Coursework and GPA*	*GPA Mean*	*Coursework Mean in Semesters*
Males					
0	8,818	428	429	84.8	32.9
½	2,281	430	430	84.6	33.1
1	5,998	431	430	84.6	33.3
1½	893	441	440	84.3	33.3
2	2,999	428	431	83.9	33.2
2½	494	449	452	84.4	32.8
3	1,647	435	440	84.1	32.7
3½	304	442	451	84.2	32.1
4	2,324	457	449	85.8	33.2
4+	1,523	451	445	85.2	33.8
Females					
0	7,312	410	414	85.9	32.6
½	2,420	421	421	85.8	33.2
1	6,827	419	419	85.8	33.2
1½	1,352	431	432	85.6	33.3
2	3,863	428	429	85.7	33.2
2½	754	436	437	85.5	33.2
3	2,524	433	436	85.7	32.8
3½	532	434	442	85.1	32.4
4	3,865	448	441	86.8	33.2
4+	2,587	448	440	86.6	33.8

Table 2. Unadjusted and Adjusted SAT-M Means for Art and Music

Coursework Years	*N*	*Unadjusted Mean*	*Adjusted for Coursework and GPA*	*GPA Mean*	*Coursework Mean in Semesters*
Males					
0	8,818	501	502	84.8	32.9
½	2,281	503	503	84.6	33.1
1	5,998	497	496	84.6	33.3
1½	893	512	513	84.3	33.3
2	2,999	487	493	83.9	33.2
2½	494	512	516	84.4	32.8
3	1,647	490	497	84.1	32.7
3½	304	497	508	84.2	32.1
4	2,324	517	506	85.8	33.2
4+	1,523	512	503	85.2	33.8
Females					
0	7,312	445	449	85.9	32.6
½	2,420	452	453	85.8	33.2
1	6,827	449	450	85.8	33.2
1½	1,352	463	464	85.6	33.3
2	3,863	451	452	85.7	33.2
2½	754	469	472	85.5	33.2
3	2,524	455	458	85.7	32.8
3½	532	456	467	85.1	32.4
4	3,865	470	462	86.8	33.2
4+	2,587	472	461	86.6	33.8

Table 3. Unadjusted and Adjusted SAT-V Means for English

Coursework Years	*N*	*Unadjusted Mean*	*Adjusted for Coursework and GPA*	*GPA Mean*	*Coursework Mean in Semesters*
Males					
< 3	239	398	426	83.6	20.7
3	1,409	404	442	83.0	22.8
3½	1,154	398	425	82.5	24.8
4	21,502	437	434	84.8	28.1
4+	2,977	446	435	85.2	30.8
Females					
< 3	188	382	449	84.8	20.4
3	1,386	390	431	84.2	23.3
3½	1,153	399	419	84.1	25.2
4	25,762	428	426	86.0	28.7
4+	3,547	446	433	86.6	31.4

Table 4. Unadjusted and Adjusted SAT-M Means for English

Coursework Years	*N*	*Unadjusted Mean*	*Adjusted for Coursework and GPA*	*GPA Mean*	*Coursework Mean in Semesters*
Males					
< 3	239	487	528	83.6	20.7
3	1,409	473	518	83.0	22.8
3½	1,154	463	497	82.5	24.8
4	21,502	503	500	84.8	28.1
4+	2,977	516	502	85.2	30.8
Females					
< 3	188	426	463	84.8	20.4
3	1,386	425	467	84.2	23.3
3½	1,153	417	448	84.1	25.2
4	25,762	456	454	86.0	28.7
4+	3,547	473	459	86.6	31.4

Table 5. Unadjusted and Adjusted SAT-V Means for Foreign Languages

Coursework Years	*N*	*Unadjusted Mean*	*Adjusted for Coursework and GPA*	*GPA Mean*	*Coursework Mean in Semesters*
Males					
0	2,569	361	381	82.1	29.4
½	402	359	378	79.9	29.5
1	2,539	385	401	82.4	30.0
1½	355	393	406	81.5	29.8
2	9,963	424	426	84.5	31.2
2½	431	436	442	84.0	30.8
3	6,255	461	453	85.6	31.7
3½	305	448	448	84.7	31.3
4	3,244	495	472	87.3	32.6
4+	1,218	501	485	87.5	34.5
Females					
0	1,699	345	366	83.9	28.9
½	294	347	374	81.7	29.4
1	2,479	367	385	84.0	29.3
1½	372	369	392	82.0	29.2
2	10,620	408	412	85.5	31.0
2½	600	413	430	84.1	30.4
3	7,669	440	436	86.2	31.8
3½	412	439	443	85.5	31.4
4	5,756	475	458	87.8	32.6
4+	2,135	496	478	88.1	33.8

Table 6. Unadjusted and Adjusted SAT-M Means for Foreign Languages

Coursework Years	*N*	*Unadjusted Mean*	*Adjusted for Coursework and GPA*	*GPA Mean*	*Coursework Mean in Semesters*
Males					
0	2,569	420	448	82.1	29.4
½	402	410	447	79.9	29.5
1	2,539	443	465	82.4	30.0
1½	355	454	476	81.5	29.8
2	9,963	492	494	84.5	31.2
2½	431	501	507	84.0	30.8
3	6,255	531	520	85.6	31.7
3½	305	514	513	84.7	31.3
4	3,244	567	538	87.3	32.6
4+	1,218	576	550	87.5	34.5
Females					
0	1,699	376	399	83.9	28.9
½	294	362	398	81.7	29.4
1	2,479	389	412	84.0	29.3
1½	372	392	425	82.0	29.2
2	10,620	437	442	85.5	31.0
2½	600	436	453	84.1	30.4
3	7,669	470	466	86.2	31.8
3½	412	463	467	85.5	31.4
4	5,756	502	481	87.8	32.6
4+	2,135	527	501	88.1	33.8

Table 7. Unadjusted and Adjusted SAT-V Means for Mathematics

Coursework Years	*N*	*Unadjusted Mean*	*Adjusted for Coursework and GPA*	*GPA Mean*	*Coursework Mean in Semesters*
Males					
< 2	118	355	399	79.8	19.8
2	955	367	404	80.0	23.9
2½	415	390	428	81.3	23.4
3	5,446	405	431	82.1	26.3
3½	1,347	411	431	82.9	26.6
4	14,237	441	433	85.3	29.0
4+	4,763	470	439	87.7	30.9
Females					
< 2	166	341	419	80.9	21.3
2	1,767	368	406	82.3	25.3
2½	580	387	426	82.7	25.5
3	8,379	407	426	84.2	27.9
3½	1,723	412	426	84.6	28.5
4	15,652	439	427	86.9	30.2
4+	3,769	460	425	88.9	32.2

Table 8. Unadjusted and Adjusted SAT-M Means for Mathematics

Coursework Years	*N*	*Unadjusted Mean*	*Adjusted for Coursework and GPA*	*GPA Mean*	*Coursework Mean in Semesters*
Males					
< 2	118	387	400	79.8	19.8
2	955	375	401	80.0	23.9
2½	415	432	459	81.3	23.4
3	5,446	442	466	82.1	26.3
3½	1,347	470	489	82.9	26.6
4	14,237	513	504	85.3	29.0
4+	4,763	574	543	87.7	30.9
Females					
< 2	166	332	345	80.9	21.3
2	1,767	355	379	82.3	25.3
2½	580	395	421	82.7	25.5
3	8,379	415	431	84.2	27.9
3½	1,723	438	451	84.6	28.5
4	15,652	475	463	86.9	30.2
4+	3,769	527	493	88.9	32.2

Table 9. Unadjusted and Adjusted SAT-V Means for Natural Science

Coursework Years	*N*	*Unadjusted Mean*	*Adjusted for Coursework and GPA*	*GPA Mean*	*Coursework Mean in Semesters*
Males					
< 1	223	333	355	82.2	22.8
1½	897	365	396	80.8	25.4
2	4,712	388	412	82.0	27.3
2½	607	412	437	82.1	26.9
3	8,373	425	431	83.9	29.1
3½	903	435	437	84.6	29.1
4	9,293	464	445	86.5	30.8
4+	2,273	485	455	88.2	32.8
Females					
< 1	263	326	375	82.7	24.0
1½	1,358	359	395	82.5	26.5
2	7,262	392	413	84.1	28.7
2½	864	410	425	84.4	29.2
3	11,001	428	428	85.7	30.7
3½	970	435	432	86.1	31.0
4	8,532	458	435	88.0	32.1
4+	1,786	475	443	89.1	33.9

Table 10. Unadjusted and Adjusted SAT-M Means for Natural Science

Coursework Years	*N*	*Unadjusted Mean*	*Adjusted for Coursework and GPA*	*GPA Mean*	*Coursework Mean in Semesters*
Males					
< 1	223	407	441	82.2	22.8
1½	897	408	446	80.8	25.4
2	4,712	435	463	82.0	27.3
2½	607	465	495	82.1	26.9
3	8,373	488	496	83.9	29.1
3½	903	505	506	84.6	29.1
4	9,293	540	519	86.5	30.8
4+	2,273	578	545	88.2	32.8
Females					
< 1	263	360	400	82.7	24.0
1½	1,358	377	443	82.5	26.5
2	7,262	410	432	84.1	28.7
2½	864	434	451	84.4	29.2
3	11,001	454	455	85.7	30.7
3½	970	466	463	86.1	31.0
4	8,532	494	469	88.0	32.1
4+	1,786	526	489	89.1	33.9

Table 11. Unadjusted and Adjusted SAT-V Means for Social Science

Coursework Years	*N*	*Unadjusted Mean*	*Adjusted for Coursework and GPA*	*GPA Mean*	*Coursework Mean in Semesters*
Males					
< 2	523	368	396	82.5	23.9
2	2,681	407	422	83.7	27.5
2½	1,159	432	439	84.8	27.7
3	9,497	432	433	84.9	28.8
3½	2,313	444	441	85.1	29.2
4	9,095	441	437	84.6	30.0
4+	2,013	456	452	85.0	32.1
Females					
< 2	613	364	400	83.9	24.8
2	2,985	396	414	84.8	28.1
2½	1,400	424	433	85.7	28.7
3	11,342	423	423	86.2	29.6
3½	2,932	435	434	86.1	29.8
4	10,458	436	431	86.0	30.8
4+	2,306	449	442	86.4	32.4

Table 12. Unadjusted and Adjusted SAT-M Means for Social Science

Coursework Years	*N*	*Unadjusted Mean*	*Adjusted for Coursework and GPA*	*GPA Mean*	*Coursework Mean in Semesters*
Males					
< 2	523	454	502	82.5	23.9
2	2,681	482	501	83.7	27.5
2½	1,159	509	518	84.8	27.7
3	9,497	502	503	84.9	28.8
3½	2,313	518	515	85.1	29.2
4	9,095	499	494	84.6	30.0
4+	2,013	515	505	85.0	32.1
Females					
< 2	613	404	442	83.9	24.8
2	2,985	429	450	84.8	28.1
2½	1,400	458	468	85.7	28.7
3	11,342	455	455	86.2	29.6
3½	2,932	468	467	86.1	29.8
4	10,458	457	451	86.0	30.8
4+	2,306	471	460	86.4	32.4

Table 13. Partial Correlations between Years of Study in Discipline and SAT-V Performance by Ethnic Group and Income

	N	*Art and Music*	*English*	*Foreign Language*	*Mathematics*	*Natural Science*	*Social Science*
American Indian	547	.082*	−.014*	.258	−.032*	.089*	.038*
Asian American	3,560	.082	−.014*	.284	−.040*	.155	.069
Black	5,467	.036	−.043*	.338	.039	.153	.069
Mexican American	1,302	.044*	.036*	.182	−.083	.184	.103
Puerto Rican	618	.148	.063*	.212	.030*	.111	−.014*
Other Hispanic	1,096	−.047*	.074*	.190	−.026*	.117	.079
White	45,357	.077	−.022	.268	.047	.128	.039
Other	718	.057*	.008*	.247	−.019*	.116	.043*
Income							
< $30,000	20,314	.083	−.010*	.236	.015*	.132	.070
$30,000–$50,000	18,624	.080	.016*	.250	.043	.131	.042
> $50,000	15,732	.076	−.027	.252	.034	.124	.059

* Not statistically significant at .01

Table 14. Partial Correlations between Years of Study in Discipline and SAT-M Performance by Ethnic Group and Income

	N	*Art and Music*	*English*	*Foreign Language*	*Mathematics*	*Natural Science*	*Social Science*
American Indian	547	−.048*	.025*	.195	.273	.156	−.028*
Asian American	3,560	.068	−.037*	.128	.193	.239	−.093
Black	5,467	−.007*	−.016	.209	.181	.217	−.004*
Mexican American	1,302	.054*	−.042*	.119	.265	.236	.043*
Puerto Rican	618	.102*	.023*	.161	.194	.157	−.012*
Other Hispanic	1,096	.027*	.030*	.165	.218	.193	−.037*
White	45,357	−.012	−.049	.219	.280	.222	−.028
Other	718	−.017*	−.011*	.157	.295	.261	−.046*
Income							
< $30,000	20,314	−.003*	−.021	.188	.250	.228	−.010*
$30,000–$50,000	18,624	−.005*	−.040	.191	.271	.223	−.029
> $50,000	15,732	−.037	−.054	.206	.260	.210	−.027

* Not statistically significant at .01

Table 15. SAT-V Linear Regression Weight for Years of Coursework within Levels of GPA and Amount of Additional Coursework, Females

Student-Reported GPA	*Semesters Coursework Excluding Discipline*	*Art and Music*	*English*	*Foreign Language*	*Mathematics*	*Natural Science*	*Social Science*
A	34+	6	−1*	21	6	13	4
	27–33	10	12*	29	18	18	12
	< 27	13	6*	29	11	22	13
B	34+	5	−9*	25	0*	9	1*
	27–33	9	11	28	6	14	11
	< 27	11	8	27	11	20	14
C or lower	34+	3*	3*	18	10	5*	−1*
	27–33	8	16*	22	−2*	11	12
	< 27	7	5*	22	5*	12	12

* Not statistically significant at .01

Table 16. SAT-V Linear Regression Weight for Years of Coursework within Levels of GPA and Amount of Additional Coursework, Males

Student-Reported GPA	*Semesters Coursework Excluding Discipline*	*Art and Music*	*English*	*Foreign Language*	*Mathematics*	*Natural Science*	*Social Science*
A	34+	5	−23*	19	3*	7*	3*
	27–33	13	23	27	15	21	13
	< 27	14	2*	33	21	30	21
B	34+	3	−1*	24	0*	12	−1*
	27–33	6	16	27	13	21	11
	< 27	9	−4*	25	12	20	8
C or lower	34+	2*	−18*	17	−17	0*	−3*
	27–33	5	7*	20	3*	13	7
	< 27	5	−2*	26	8	20	12

* Not statistically significant at .01

Table 17. SAT-M Linear Regression Weight for Years of Coursework within Levels of GPA and Amount of Additional Coursework, Females

Student-Reported GPA	*Semesters Coursework Excluding Discipline*	*Art and Music*	*English*	*Foreign Language*	*Mathematics*	*Natural Science*	*Social Science*
A	34+	3	−10*	17	52	25	−3*
	27–33	6	7*	27	66	28	2*
	< 27	7*	−4*	23	46	26	−1*
B	34+	3	−17	26	38	18	−7
	27–33	4	11*	27	42	21	2*
	< 27	5	−2*	26	34	21	7
C or lower	34+	1*	11*	18	6*	7*	8*
	27–33	6	6*	21	19	13	4*
	< 27	4*	−9*	17	17	14	7

* Not statistically significant at .01

Table 18. SAT-M Linear Regression Weight for Years of Coursework within Levels of GPA and Amount of Additional Coursework, Males

Student-Reported GPA	*Semesters Coursework Excluding Discipline*	*Art and Music*	*English*	*Foreign Language*	*Mathematics*	*Natural Science*	*Social Science*
A	34+	2*	−15*	17	53	24	−3*
	27–33	4*	12*	21	68	27	−3*
	< 27	7*	−4*	35	57	36	0*
B	34+	0*	−15*	26	46	24	−13
	27–33	2*	12	29	59	33	−2*
	< 27	2*	−11	25	44	31	1*
C or lower	34+	2*	−16*	22	20	11	−21
	27–33	0*	−5*	23	30	23	0*
	< 27	3*	−12	25	25	24	3*

* Not statistically significant at .01

Table 19. Unadjusted and Adjusted SAT-V Mean Differences for Art and Music Courses

	Number Taking Course	*SAT-V Mean*	*Unadjusted Difference*	*Adjusted for Other Art and Music Courses, Other Coursework, and GPA*	*GPA Mean*	*Coursework Mean in Semesters*
Males						
Acting	4,651	475	50	29	85.8	34.0
Art History	5,022	440	8	−1*	84.6	33.5
Dance	879	444	10	−21	85.4	33.8
Drama Appreciation	2,342	465	34	6*	85.4	33.7
Music Appreciation	4,539	461	32	14	85.3	34.1
Music Performance	8,583	456	32	12	85.6	33.6
Photography	3,997	452	21	14	84.5	33.5
Studio Art	4,794	444	13	15	84.2	33.1
Females						
Acting	8,194	461	46	28	86.7	33.8
Art History	6,526	443	21	7	86.1	33.7
Dance	6,268	434	10	−6	86.1	33.5
Drama Appreciation	4,827	450	28	4*	86.2	33.4
Music Appreciation	6,106	450	30	10	86.6	33.9
Music Performance	14,172	441	27	11	86.6	33.4
Photography	4,690	441	17	12	85.5	33.4
Studio Art	5,939	444	21	20	85.5	33.4

* Not statistically significant at .01

Table 20. Unadjusted and Adjusted SAT-M Mean Differences for Art and Music Courses

	Number Taking Course	*SAT-M Mean*	*Unadjusted Difference*	*Adjusted for Other Art and Music Courses, Other Coursework, and GPA*	*GPA Mean*	*Coursework Mean in Semesters*
Males						
Acting	4,651	527	33	13	85.8	34.0
Art History	5,022	497	−4	−9	84.6	33.5
Dance	879	503	4	−15	85.4	33.8
Drama Appreciation	2,342	517	18	0*	85.4	33.7
Music Appreciation	4,539	517	21	3*	85.3	34.1
Music Performance	8,583	519	28	9	85.6	33.6
Photography	3,997	514	16	12	84.5	33.5
Studio Art	4,794	502	3	8	84.2	33.1
Females						
Acting	8,194	476	29	12	86.7	33.8
Art History	6,526	463	11	0*	86.1	33.7
Dance	6,268	461	8	−1*	86.1	33.5
Drama Appreciation	4,827	463	10	−4*	86.2	33.4
Music Appreciation	6,106	470	20	1*	86.6	33.9
Music Performance	4,172	468	24	9	86.6	33.4
Photography	4,690	465	13	11	85.5	33.4
Studio Art	5,939	467	16	17	85.5	33.4

* Not statistically significant at .01

Table 21. Unadjusted and Adjusted SAT-V Mean Differences for English Courses

	Number Taking Course	*SAT-V Mean*	*Unadjusted Difference*	*Adjusted for Other English Courses, Other Coursework, and GPA*	*GPA Mean*	*Coursework Mean in Semesters*
Males						
American Literature	27,664	441	76	23	85.1	28.3
British Literature	16,309	463	65	28	85.9	29.0
Composition	26,880	441	67	25	85.1	28.3
Grammar	28,042	436	44	−9	84.9	28.2
Literature, Other Countries	6,823	463	40	5*	86.1	29.4
Literature, Hist. Periods	17,675	458	61	22	85.7	28.8
Speaking and Listening	13,753	444	24	3*	85.3	28.5
English, Second Lang.	1,596	347	−87	−77	85.3	28.3
Females						
American Literature	32,523	433	71	20	86.3	28.9
British Literature	18,896	457	58	31	87.2	29.8
Composition	32,254	432	70	19	86.3	28.9
Grammar	33,624	427	39	−11	86.1	28.7
Literature, Other Countries	8,236	462	48	12	87.2	30.3
Literature, Hist. Periods	22,286	448	61	23	86.8	29.4
Speaking and Listening	17,520	437	16	6	86.4	29.1
English, Second Lang.	1,617	342	−82	−74	86.1	28.7

* Not statistically significant at .01

Table 22. Unadjusted and Adjusted SAT-M Mean Differences for English Courses

	Number Taking Course	*SAT-M Mean*	*Unadjusted Difference*	*Adjusted for Other English Courses, Other Coursework, and GPA*	*GPA Mean*	*Coursework Mean in Semesters*
Males						
American Literature	27,664	505	65	15	85.1	28.3
British Literature	16,309	525	58	18	85.9	29.0
Composition	26,880	506	65	23	85.1	28.3
Grammar	28,242	502	46	−1*	84.9	28.2
Literature, Other Countries	6,823	525	37	2*	86.1	29.4
Literature, Hist. Periods	17,675	520	53	14	85.7	28.8
Speaking and Listening	13,753	509	23	−1*	85.3	28.5
English, Second Lang.	1,596	488	13	−9	85.3	28.3
Females						
American Literature	32,523	458	58	12	86.3	28.9
British Literature	18,896	479	58	20	87.2	29.8
Composition	32,254	458	53	17	86.3	28.9
Grammar	33,624	454	33	−8	86.1	28.7
Literature, Other Countries	8,236	483	41	6	87.2	30.3
Literature, Hist. Periods	22,286	470	48	13	86.8	29.4
Speaking and Listening	17,520	462	21	2*	86.4	29.1
English, Second Lang.	1,617	434	−13	−8*	86.1	28.7

* Not statistically significant at .01

Table 23. Unadjusted and Adjusted SAT-V Mean Differences for Foreign Language Courses

	Number Taking Course	*SAT-V Mean*	*Unadjusted Difference*	*Adjusted for Other Language Courses, Other Coursework, and GPA*	*GPA Mean*	*Coursework Mean in Semesters*
Males						
French	4,869	494	38	40	85.6	32.0
German	1,626	499	41	45	85.8	32.1
Hebrew	157	458	30	32	84.3	31.9
Italian	260	415	−17	0*	83.7	31.3
Latin	1,868	484	58	48	86.3	32.2
Russian	107	494	67	53	85.9	32.8
Spanish	8,886	429	−8	20	84.8	31.0
Other Language	527	399	−34	−32	85.3	32.3
Females						
French	8,508	447	35	39	86.5	31.9
German	1,658	463	41	42	87.2	32.7
Hebrew	187	454	27	18*	86.4	33.3
Italian	416	411	−16	6*	84.5	31.5
Latin	2,429	473	53	45	87.2	32.3
Russian	109	501	73	42	87.7	32.4
Spanish	11,810	417	−17	16	85.9	31.1
Other Language	701	395	−30	−33	86.7	32.6

* Not statistically significant at .01

Table 24. Unadjusted and Adjusted SAT-M Mean Differences for Foreign Language Courses

	Number Taking Course	*SAT-M Mean*	*Unadjusted Differences*	*Adjusted for Other Language Courses, Other Coursework, and GPA*	*GPA Mean*	*Coursework Mean in Semesters*
Males						
French	4,869	531	40	38	85.6	32.0
German	1,626	543	43	42	85.8	32.1
Hebrew	157	529	21	27	84.3	31.9
Italian	260	478	−25	−6*	83.7	31.3
Latin	1,868	551	52	39	86.3	32.2
Russian	107	558	58	35	85.9	32.8
Spanish	8,886	499	−10	16	84.8	31.0
Other Language	527	535	31	30	85.3	32.3
Females						
French	8,508	475	29	28	86.5	31.9
German	1,658	492	38	30	87.2	32.7
Hebrew	187	501	41	33	86.4	33.3
Italian	416	438	−21	−2*	84.5	31.5
Latin	2,429	495	42	31	87.2	32.3
Russian	109	515	54	15*	87.7	32.4
Spanish	11,810	449	−17	10	85.9	31.1
Other Language	701	487	31	25	86.7	32.6

* Not statistically significant at .01

Table 25. Unadjusted and Adjusted SAT-V Mean Differences for Mathematics Courses

	Number Taking Course	*SAT-V Mean*	*Unadjusted Difference*	*Adjusted for Other Math Courses, Other Coursework, and GPA*	*GPA Mean*	*Coursework Mean in Semesters*
Males						
Algebra	18,001	432	31	−8*	85.0	28.2
Geometry	17,210	438	105	45	85.3	28.4
Trigonometry	11,364	459	72	12	86.9	29.3
Precalculus	6,094	482	75	20	88.4	30.1
Calculus	4,252	501	91	18	90.0	30.6
Computer Math	6,014	452	30	4*	86.2	29.0
Females						
Algebra	22,896	425	54	−2*	86.2	29.3
Geometry	21,552	432	102	45	86.6	29.6
Trigonometry	12,651	455	67	8	88.3	30.7
Precalculus	6,042	480	76	21	89.8	31.4
Calculus	3,752	497	87	13	91.3	31.9
Computer Math	6,002	446	29	4	87.5	30.2

* Not statistically significant at .01

Table 26. Unadjusted and Adjusted SAT-M Mean Differences for Mathematics Courses

	Number Taking Course	*SAT-M Mean*	*Unadjusted Difference*	*Adjusted for Other Math Courses, Other Coursework, and GPA*	*GPA Mean*	*Coursework Mean in Semesters*
Males						
Algebra	18,801	504	34	−16	85.0	28.2
Geometry	17,210	513	159	74	85.3	28.4
Trigonometry	11,364	551	123	42	86.9	29.3
Precalculus	6,094	587	123	45	88.4	30.1
Calculus	4,252	619	160	62	90.0	30.6
Computer Math	6,014	541	54	11	86.2	29.0
Females						
Algebra	22,896	457	56	−11	86.2	29.3
Geometry	21,552	466	140	66	86.6	29.6
Trigonometry	12,651	504	117	37	88.3	30.7
Precalculus	6,042	541	115	43	89.8	31.4
Calculus	3,752	574	141	52	91.3	31.9
Computer Math	6,002	489	45	9	87.5	30.2

Table 27. Unadjusted and Adjusted SAT-V Mean Differences for Natural Science Courses

	Number Taking Course	*SAT-V Mean*	*Unadjusted Difference*	*Adjusted for Other Natural Science Courses, Other Coursework, and GPA*	*GPA Mean*	*Coursework Mean in Semesters*
Males						
Biology	16,893	433	28	8*	85.0	29.3
Chemistry	13,822	450	85	35	86.0	29.9
Geology	8,080	423	18	−8	84.2	29.5
Physics	9,280	467	74	24	87.3	30.5
Other Science	5,998	426	−10	−3*	84.7	29.1
Females						
Biology	22,306	426	45	9	86.3	30.5
Chemistry	17,139	443	72	27	87.2	31.2
Geology	9,564	419	−11	−5	85.6	30.8
Physics	7,966	466	64	16	89.0	32.0
Other Science	8,546	420	−8	−2*	86.0	30.2

* Not statistically significant at .01

Table 28. Unadjusted and Adjusted SAT-M Mean Differences for Natural Science Courses

	Number Taking Course	*SAT-M Mean*	*Unadjusted Difference*	*Adjusted for Other Natural Science Courses, Other Coursework, and GPA*	*GPA Mean*	*Coursework Mean in Semesters*
Males						
Biology	16,893	504	21	−2*	85.0	29.3
Chemistry	13,822	529	121	53	86.0	29.9
Geology	8,080	489	−28	−13	84.2	29.5
Physics	9,280	559	118	59	87.3	30.5
Other Science	5,998	495	−14	−3*	84.7	29.1
Females						
Biology	22,306	457	43	1*	86.3	30.5
Chemistry	17,139	480	95	39	87.2	31.2
Geology	9,564	447	−18	−9	85.6	30.8
Physics	7,966	518	95	42	89.0	32.0
Other Science	8,546	450	−11	−2*	86.0	30.2

* Not statistically significant at .01

Table 29. Unadjusted and Adjusted SAT-V Mean Differences for Social Science Courses

	Number Taking Course	*SAT-V Mean*	*Unadjusted Difference*	*Adjusted for Other Social Science Courses, Other Coursework, and GPA*	*GPA Mean*	*Coursework Mean in Semesters*
Males						
U.S. History	16,818	432	26	18	85.0	29.0
U.S. Government	12,904	430	−6	−4*	85.1	28.9
European History	4,710	448	23	14	84.9	30.5
World History	12,694	433	8	−2*	85.2	29.2
Ancient History	2,436	441	11	0	84.9	30.8
Anthropology	553	443	12	7	84.7	30.6
Economics	8,428	430	−4*	−2*	85.2	28.9
Geography	4,519	413	−27	−19	84.4	28.8
Psychology	4,156	441	12	13	84.6	29.2
Sociology	2,660	429	−3*	0	84.1	29.0
Females						
U.S. History	21,555	426	37	22	86.3	29.8
U.S. Government	16,591	425	−2*	−1*	86.5	29.7
European History	5,129	449	1*	18	86.2	31.5
World History	15,860	428	10	1*	86.5	30.0
Ancient History	2,453	438	16	3*	85.9	31.7
Anthropology	634	431	8	2*	85.2	31.4
Economics	10,524	421	−7	−5	86.6	29.5
Geography	5,341	408	−23	−16	85.8	29.6
Psychology	8,071	434	14	14	85.8	30.0
Sociology	4,742	425	0*	2*	85.5	29.7

* Not statistically significant at .01

Table 30. Unadjusted and Adjusted SAT-M Mean Differences for Social Science Courses

	Number Taking Course	*SAT-M Mean*	*Unadjusted Difference*	*Adjusted for Other Social Science Courses, Other Coursework, and GPA*	*GPA Mean*	*Coursework Mean in Semesters*
Males						
U.S. History	16,818	502	−22	−25	85.0	29.0
U.S. Goverment	12,904	500	−13	−11	85.1	28.9
European History	4,710	519	21	10	84.9	30.5
World History	12,694	504	4*	−8*	85.2	29.2
Ancient History	2,436	511	9	−5*	84.9	30.8
Anthropology	553	508	3*	1*	84.7	30.6
Economics	8,428	502	−2*	0*	85.2	28.9
Geography	4,519	488	−23	−14	84.4	28.8
Psychology	4,156	503	0*	4*	84.6	29.2
Sociology	2,660	491	−3*	−8*	84.1	29.0
Females						
U.S. History	21,555	457	13	−2*	86.3	29.8
U.S. Government	16,591	456	−4*	−5*	86.5	29.7
European History	5,129	479	27	14	86.2	31.5
World History	15,860	458	5	−5	86.5	30.0
Ancient History	2,453	466	10	−2*	85.9	31.7
Anthropology	634	458	2*	2*	85.2	31.4
Economics	10,524	455	−3*	−1*	86.6	29.5
Geography	5,341	444	−18	−11	85.8	29.6
Psychology	8,071	461	6	10	85.8	30.0
Sociology	4,742	453	−8	−4	85.5	29.7

* Not statistically significant at .01

Table 31. Unadjusted and Adjusted Means for Biology Achievement Test

Biology Coursework in Years	*N*	*Unadjusted Mean*	*Adjusted for All Coursework and GPA*
1	1,587	519	519
1.5 or 2	836	559	557
> 2	95	592	587
Regression Coefficient for Biology Years			39
Adjusted Mean Differences for Science and Mathematics Courses			
Algebra (2nd year)			−21
Geometry			−60*
Trigonometry			7*
Precalculus			30
Calculus			39
Physics			28
Chemistry			20

* Not statistically significant at .01

Table 32. Unadjusted and Adjusted Means for Chemistry Achievement Test

Chemistry Coursework in Years	*N*	*Unadjusted Mean*	*Adjusted for All Coursework and GPA*
1	1,388	534	533
1.5 or 2	582	603	604
> 2	91	623	649
Regression Coefficient for Chemistry Years			62
Adjusted Mean Differences for Science and Mathematics Courses			
Algebra (2nd year)			−21
Geometry			−17*
Trigonometry			−4*
Precalculus			17*
Calculus			35
Physics			27

* Not statistically significant at .01

Table 33. Unadjusted and Adjusted Means for Level I Mathematics Achievement Test

Mathematics Coursework in Years	*N*	*Unadjusted Mean*	*Adjusted for All Coursework and GPA*
< 3	113	486	485
3–3.5	1,443	495	508
4	5,557	542	541
4+	2,059	588	578
Regression Coefficient for Mathematics Years			42
Mean Differences for Mathematics Courses Adjusted for Non-Math Coursework and GPA			
Algebra (2nd year)			−14
Geometry			−33
Trigonometry			31
Precalculus			43
Calculus			73

Table 34. Unadjusted and Adjusted Means for Level II Mathematics Achievement Test

Mathematics Coursework in Years	*N*	*Unadjusted Mean*	*Adjusted for All Coursework and GPA*
< 4	191	613	636
4	1,658	640	641
4+	1,133	669	666
Regression Coefficient for Mathematics Years		45	30
Mean Differences for Mathematics Courses Adjusted for Non-Math Coursework and GPA			
Algebra (2nd year)			−12*
Geometry			−76
Trigonometry			−5*
Precalculus			24
Calculus			78

* Not statistically significant at .01

Table 35. Unadjusted and Adjusted Means for French Achievement Test

French Coursework in Years	*N*	*Unadjusted Mean*	*Adjusted for All Coursework and GPA*
< 4	192	465	477
4	392	539	537
4+	155	573	560
Regression Coefficient for French Years		49	46

Table 36. Unadjusted and Adjusted Means for Spanish Achievement Test

Spanish Coursework in Years	*N*	*Unadjusted Mean*	*Adjusted for All Coursework and GPA*
< 4	301	451	459
4	348	511	507
4+	127	540	531
Regression Coefficient for Spanish Years		29	25

Table 37. Unadjusted and Adjusted Means for American History Achievement Test

American History Coursework in Years	*N*	*Unadjusted Mean*	*Adjusted for All Coursework and GPA*
1	2,343	518	518
> 1	427	544	558
Regression Coefficient for American History Years		25	25
Mean Differences for Social Science Courses Adjusted for All Coursework and GPA			
U.S. Government			−14*
European History			33
World History			2*
Ancient History			17

* Not statistically significant at .01

Table 38. Unadjusted and Adjusted Means for English Composition Achievement Test

English Coursework in Years	*N*	*Unadjusted Mean*	*Adjusted for All Coursework and GPA*
< 4	713	484	522
4	9,337	517	515
4+	1,606	530	525
Regression Coefficient for English Years		29	−2*
Mean Differences for English Coursework Adjusted for Non-English Coursework and GPA			
American Literature			32
British Literature			34
Composition			31
Grammar			15*
Literature, Other Countries			22
Literature, Historic Periods			33
Speaking and Listening			11*

* Not statistically significant at .01

Table 39. Adjusted Means for SAT-M and Level I Mathematics Achievement Test in Level I Sample

Mathematics Coursework in Years	*N*	*Adjusted for All Coursework and GPA*	
		Math I	*SAT-M*
< 3	113	485	516
3–3.5	1,443	508	535
4	5,557	541	561
4+	2,059	578	597
Regression Coefficient for Mathematics Years		42(.47)[a]	37(.39)
Mean Differences for Mathematics Courses Adjusted for Non-Math Coursework and GPA			
Algebra (2nd year)		−14 (−.16)	−15 (−.16)
Geometry		−33 (−.37)	−17 (−.18)
Trigonometry		31 (.34)	33 (.34)
Precalculus		43 (.48)	41 (.43)
Calculus		73 (.81)	68 (.71)

[a]Numbers in parentheses are based on standard deviation units

Table 40. Adjusted Means for SAT-M and Level II Mathematics Achievement Test in Level II Sample

Mathematics Coursework in Years	*N*	*Adjusted for All Coursework and GPA*	
		Level II	*SAT-M*
< 4	191	629	629
4	1,658	641	637
4+	1,133	665	657
Regression Coefficient for Mathematics Years		31(.34)[a]	27(.32)
Mean Differences for Mathematics Courses Adjusted for Non-Math Coursework and GPA			
Algebra (2nd year)		−1 (−.01)[b]	−7 (−.08)[b]
Geometry		−72 (−.80)	−58 (−.68)
Trigonometry		−3 (−.03)[b]	−1 (−.01)[b]
Precalculus		21 (.23)	16 (.19)
Calculus		82 (.90)	54 (.64)

[a]Numbers in parentheses are based on standard deviation units

[b] Not statistically significant at .01

Table 41. Adjusted Means for SAT-V, TSWE, and English Composition Achievement Test in ECT Sample

English Coursework in Years	*N*	*Adjusted for All Coursework and GPA*		
		ECT	*SAT-V*	*TSWE*
< 4	713	522	528	51.2
4	9,337	515	514	50.6
4+	1,606	525	521	51.0
Regression Coefficient for English Years		−2*(−.02)*	−0(−.06)	−.3*(−.04)
Mean Differences for English Coursework Adjusted for Non-English Coursework and GPA				
American Literature		.32 (.33)	.42 (.42)	3.2 (.39)
British Literature		.34 (.35)	.42 (.42)	2.9 (.35)
Composition		.31 (.32)	.28 (.28)	2.8 (.34)
Grammar		.15 (.15)*	.13 (.13)*	1.8 (.22)
Literature, Other Countries		.22 (.22)	.27 (.27)	1.4 (.17)
Literature, Historic Periods		.33 (.34)	.40 (.40)	3.0 (.36)
Speaking and Listening		.11 (.11)*	.13 (.13)*	.9 (.11)*

*Numbers in parentheses are based on standard deviation units

* Not statistically significant at .01

Table 42. Adjusted SAT-V and TSWE Means for English Courses (Adjusted for Coursework and GPA)

Coursework Years	*Males*			*Females*		
	N	*SAT-V*	*TSWE*	*N*	*SAT-V*	*TSWE*
< 3	239	426	41.1	188	449	43.7
3	1,409	442	43.2	1,386	451	44.1
3½	1,154	425	41.7	1,153	419	42.9
4	21,502	434	42.5	25,762	426	44.1
4+	2,977	435	42.3	3,547	433	44.3

Table 43. Adjusted SAT-V and TSWE Mean Differences for English Courses (Adjusted for Other English Courses, Other Coursework, and GPA)

Course	*Males*			*Females*		
	N	*SAT-V*	*TSWE*	*N*	*SAT-V*	*TSWE*
American Literature	27,664	23	2.2	32,523	20	2.1
British Literature	16,309	28	2.3	18,896	31	2.7
Composition	26,880	25	2.4	32,254	19	1.9
Grammar	28,042	−9	1*	33,624	−11	1*
Literature, Other Countries	6,823	5*	2*	8,236	12	.7
Literature, Historic Periods	17,675	22	2.2	22,286	23	2.1
Speaking and Listening	13,753	3*	−1*	17,520	6	.3
English, Second Language	1,596	−77	−7.2	1,617	−74	−7.5

* Not statistically significant at .01

APPENDIX 1

Standard Deviations of SAT-V by Years of Coursework

Coursework Years	*Art and Music*	*English*	*Foreign Language*	*Mathematics*	*Natural Science*	*Social Science*
Males						
0	106	94	100	104	96	98
½	110	*	95	*	95	*
1	108	96	99	87	94	99
1½	111	*	92	108	96	112
2	106	129	98	96	100	107
2½	114	114	111	101	102	107
3	113	106	101	102	104	108
3½	111	100	104	102	103	106
4	111	108	105	106	103	107
4+	114	118	120	114	115	114
Females						
0	101	*	93	*	99	97
½	108	*	97	*	76	102
1	105	*	94	89	90	104
1½	110	*	97	98	110	115
2	105	125	95	93	98	105
2½	110	122	97	106	100	104
3	106	105	98	99	101	105
3½	108	96	105	100	108	104
4	104	104	100	105	103	104
4+	107	114	108	110	111	105

*N < 20

Standard Deviations of SAT-M by Years of Coursework

Coursework Years	*Art and Music*	*English*	*Foreign Language*	*Mathematics*	*Natural Science*	*Social Science*
Males						
0	122	123	120	118	117	138
½	125	*	108	*	110	*
1	121	126	114	100	104	134
1½	122	*	105	109	102	125
2	122	142	113	86	108	125
2½	123	119	115	109	112	121
3	124	118	114	106	116	123
3½	120	115	120	109	113	119
4	124	122	112	115	112	121
4+	125	127	116	118	121	122
Females						
0	110	*	104	*	103	119
½	115	*	94	*	88	116
1	110	*	106	67	92	114
1½	114	*	99	75	100	111
2	111	123	102	80	98	112
2½	114	121	105	94	101	113
3	110	108	105	94	105	112
3½	111	103	109	98	113	110
4	110	111	105	108	108	110
4+	113	115	107	114	118	110

*N < 20

APPENDIX 2

Standard Deviations of SAT by Course

		SAT-V		SAT-M	
		Males	*Females*	*Males*	*Females*
Acting	Yes	112	108	122	111
	No	106	102	123	110
Art History	Yes	109	106	123	110
	No	109	105	124	112
Dance	Yes	109	106	124	109
	No	108	105	126	112
Drama Appreciation	Yes	108	107	122	111
	No	108	104	124	111
Music Appreciation	Yes	111	107	126	115
	No	108	104	123	110
Music Performance	Yes	112	107	126	113
	No	106	102	122	108
Photography	Yes	108	105	124	110
	No	104	105	124	111
Studio Art	Yes	105	106	119	110
	No	109	105	125	111
American Literature	Yes	106	103	121	109
	No	104	99	129	111
British Literature	Yes	105	102	118	108
	No	103	97	122	107
Composition	Yes	107	104	122	110
	No	103	100	120	108
Grammar	Yes	107	104	123	110
	No	115	110	126	115
Literature, Other Countries	Yes	112	109	123	111
	No	107	101	123	110
Literature, Historic Periods	Yes	105	102	119	108
	No	105	99	123	110
Speaking and Listening	Yes	110	105	124	110
	No	107	104	123	111
English as a Second Language	Yes	105	104	134	124
	No	107	108	123	111
French	Yes	109	105	118	109
	No	107	103	124	111
German	Yes	107	105	118	110
	No	108	105	124	111
Hebrew	Yes	106	108	119	109
	No	109	105	124	111
Italian	Yes	98	98	118	113
	No	109	105	124	111
Latin	Yes	105	104	114	108
	No	108	104	124	111
Russian	Yes	109	121	127	118
	No	109	105	124	111
Spanish	Yes	103	100	118	107
	No	115	110	129	115
Other Language	Yes	130	117	137	120
	No	108	105	123	111
Algebra	Yes	108	105	123	110
	No	139	126	177	152
Geometry	Yes	107	103	119	107
	No	99	90	106	83
Trigonometry	Yes	105	102	109	101
	No	101	98	109	95
Precalculus	Yes	105	102	99	96
	No	103	100	115	102
Calculus	Yes	109	103	93	93
	No	101	100	111	101

Continued on next page

Standard Deviations of SAT by Course (continued)

		SAT-V		SAT-M	
		Males	*Females*	*Males*	*Females*
Computer Math	Yes	105	101	119	106
	No	110	105	123	110
Biology	Yes	109	105	123	111
	No	117	116	136	127
Chemistry	Yes	106	103	116	107
	No	94	94	103	95
Geology	Yes	101	100	118	105
	No	114	109	127	115
Physics	Yes	108	107	111	106
	No	97	97	106	99
Other Science	Yes	108	103	124	110
	No	109	106	124	112
U.S. History	Yes	108	105	123	111
	No	125	110	148	124
U.S. Government	Yes	108	105	122	110
	No	112	107	128	115
European History	Yes	108	104	121	110
	No	109	104	124	111
World History	Yes	108	104	122	110
	No	112	107	129	114
Ancient History	Yes	111	107	125	111
	No	108	105	124	111
Anthropology	Yes	113	107	124	108
	No	109	105	124	111
Economics	Yes	107	104	123	111
	No	110	106	124	112
Geography	Yes	106	101	124	108
	No	109	106	123	112
Psychology	Yes	104	96	120	105
	No	110	110	125	113
Sociology	Yes	104	97	118	105
	No	110	107	124	113

APPENDIX 3

Standard Deviations of Achievement Tests

		Biology	*Chemistry*	*Math I*	*Math II*	*French*	*Spanish*	*English Composition*	*American History*
1 year		100	91						96
1.5–2 years		97	90						97 (more than 1 year)
2 years		96	95						
< 3 years				89					
3–3.5 years				84					
< 4 years					111	95	111	101	
4 years				85	93	100	102	97	
4+ years				88	85	104	97	104	
Algebra	Yes	99	97	90	93				
	No	97	97	92	82				
Geometry	Yes	99	97	90	93				
	No	106	106	99	89				
Trigonometry	Yes	98	96	86	92				
	No	105	101	94	101				
Precalculus	Yes	96	94	83	88				
	No	99	101	89	103				
Calculus	Yes	94	93	82	81				
	No	96	90	81	100				
Physics	Yes	97		96					
	No	96		93					
Chemistry	Yes	98							
	No	106							
U.S. Goverment	Yes								96
	No								98
European History	Yes								93
	No								97
World History	Yes								96
	No								98
Ancient History	Yes								93
	No								97